

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A heat exchanger for use with an electronic heat pump, said heat exchanger comprising:

a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said electronic heat pump;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width $W(\text{mm})$,

an inlet end, and an outlet end, and;

wherein the minimum number of channels/meter N is defined by the approximation:

$$N = 195 * W + 5$$

2. (Original) A heat exchanger according to claim 1 wherein the height of each narrow channel is less than about 10mm.

3. (Original) A heat exchanger according to claim 1 wherein the thermal resistance of said heat exchanger is less than $0.1^{\circ}\text{C}/\text{W}$ for a 40mm heat exchanger width.

4. (Currently Amended) A heat exchanger for use with an electronic heat pump, said heat exchanger comprising:

a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said electronic heat pump;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width $W(\text{mm})$,

an inlet end and an outlet end, and;

wherein the minimum thickness $M(\text{mm})$ of each wall is defined by the approximation:

$$M = 0.308 * W + 0.055$$

5. (Original) A heat exchanger according to claim 4 wherein the height of each narrow channel is less than about 10mm.

6. (Original) A heat exchanger according to claim 4 wherein the thermal resistance of said heat exchanger is less than $0.1^{\circ}\text{C}/\text{W}$ for a 40mm heat exchanger width.

7. (Currently Amended) A heat exchanger for use with an electronic heat pump, said heat exchanger comprising:

a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said electronic heat pump;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width $W(\text{mm})$,

an inlet end and an outlet end,

wherein the minimum number of channels/meter N is defined by the approximation:

$$N = 195 * W + 5, \text{ and};$$

wherein the minimum thickness $M(\text{mm})$ of each wall is defined by the approximation:

$$M = 0.308 * W + 0.055$$

8. (Original) A heat exchanger according to claim 7 wherein the height of each narrow channel is less than about 10mm.

9. (Original) A heat exchanger according to claim 7 wherein the thermal resistance of said heat exchanger is less than 0.1°C/W for a 40mm heat exchanger width.

10. (Currently Amended) A heat exchanger for use with an electronic heat pump, said heat exchanger comprising:

a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said electronic heat pump;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width W,

an inlet end and an outlet end, and;

~~wherein the channel width W(mm) and the minimum number (N) of channels per meter are within the following ranges:~~

W	N
0.1	25
0.2	50
0.3	70
0.4	85
0.5	100
0.6	125
0.7	150
1.0	200

wherein the number of channels per meter is equal to or greater than the value N for a given range of width (W) in the following table:

<u>W</u>	<u>N</u>
<u>0.05 - 0.09</u>	<u>25</u>
<u>0.1 - 0.19</u>	<u>55</u>
<u>0.2 - 0.29</u>	<u>80</u>
<u>0.3 - 0.39</u>	<u>110</u>
<u>0.4 - 0.49</u>	<u>145</u>
<u>0.5 - 0.59</u>	<u>170</u>
<u>0.6 - 0.69</u>	<u>200</u>
<u>0.7 - 1.0</u>	<u>310</u>

11. (Original) A heat exchanger according to claim 10 wherein the height of each narrow channel is less than about 10mm.

12. (Original) A heat exchanger according to claim 10 wherein the thermal resistance of said heat exchanger is less than 0.1°C/W for a 40mm heat exchanger width.

13. (Currently Amended) A heat exchanger for use with an electronic heat pump, said heat exchanger comprising:

a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said electronic heat pump;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width W,

an inlet end and an outlet end, and;

~~wherein the channel width W(mm) and the minimum wall thickness T(mm) are within the following ranges:~~

<u>W</u>	<u>T</u>
<u>0.1</u>	<u>0.08</u>
<u>0.2</u>	<u>0.1</u>
<u>0.3</u>	<u>0.15</u>
<u>0.4</u>	<u>0.19</u>
<u>0.5</u>	<u>0.22</u>
<u>0.6</u>	<u>0.25</u>
<u>0.7</u>	<u>0.27</u>
<u>1.0</u>	<u>0.33</u>

wherein the thickness (mm) of the walls is equal to or greater than the T for a given range of channel width W (mm) in the following table:

<u>W</u>	<u>T</u>
<u>0.05 – 0.09</u>	<u>0.025</u>
<u>0.1 – 0.19</u>	<u>0.05</u>
<u>0.2 – 0.29</u>	<u>0.10</u>
<u>0.3 – 0.39</u>	<u>0.15</u>
<u>0.4 – 0.49</u>	<u>0.175</u>
<u>0.5 – 0.59</u>	<u>0.20</u>
<u>0.6 – 0.69</u>	<u>0.235</u>
<u>0.7 - 1.0</u>	<u>0.25</u>

14. (Original) A heat exchanger according to claim 13 wherein the height of each narrow channel is less than about 10mm.

15. (Original) A heat exchanger according to claim 13 wherein the thermal resistance of said heat exchanger is less than 0.1°C/W for a 40mm heat exchanger width.

16. (Currently Amended) A heat exchanger for use with an electronic heat pump, said heat exchanger comprising:

a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said electronic heat pump;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width W (mm),
an inlet end and an outlet end, and;

~~wherein the channel width W (mm) and the minimum wall thickness T (mm)
are within the following ranges:~~

W	T
0.1	0.08
0.2	0.1
0.3	0.15
0.4	0.19
0.5	0.22
0.6	0.25
0.7	0.27
1.0	0.33

wherein the thickness (mm) of the walls is equal to or greater than the T for a given range of channel width W (mm) in the following table:

W	T
0.05 – 0.09	0.025
0.1 – 0.19	0.05
0.2 – 0.29	0.10
0.3 – 0.39	0.15
0.4 – 0.49	0.175
0.5 – 0.59	0.20
0.6 – 0.69	0.235
0.7 – 1.0	0.25

~~and wherein the channel width W (mm) and the minimum number (N) of channels per meter are within the following ranges:~~

W	N
0.1	25
0.2	50
0.3	70
0.4	85
0.5	100

0.6	125
0.7	150
1.0	200

wherein the number of channels per meter is equal to or greater than the value N for a given range of width (W) in the following table:

<u>W</u>	<u>N</u>
<u>0.05 - 0.09</u>	<u>25</u>
<u>0.1 - 0.19</u>	<u>55</u>
<u>0.2 - 0.29</u>	<u>80</u>
<u>0.3 - 0.39</u>	<u>110</u>
<u>0.4 - 0.49</u>	<u>145</u>
<u>0.5 - 0.59</u>	<u>170</u>
<u>0.6 - 0.69</u>	<u>200</u>
<u>0.7 - 1.0</u>	<u>310</u>

17. (Original) A heat exchanger according to claim 16 wherein the height of each narrow channel is less than about 10mm.

18. (Original) A heat exchanger according to claim 16 wherein the thermal resistance of said heat exchanger is less than 0.1°C/W for a 40mm heat exchanger width.

19. (New) A heat exchanger for use with a heat source, said heat exchanger comprising:
a thermally conductive base having a first surface and a second surface, said first surface being adapted to make intimate surface contact with a surface of said heat source;
a thermally conductive cover spaced from said base;
a plurality of thermally conductive walls of thickness T between said base and said cover;
a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;
wherein each narrow channel has a width W(mm),
an inlet end, and an outlet end, and;

wherein the minimum number of channels/meter N is defined by the approximation:

$$N = 195 * W + 5.$$

20. (New) A heat exchanger comprising:

a thermally conductive base;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T extending between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width W(mm),

an inlet end, and an outlet end;

wherein the minimum number of channels/meter N is defined by the approximation:

$$N = 195 * W + 5; \text{ and}$$

wherein the thermal resistance of said heat exchanger is less than 0.1°C/W for a 40mm heat exchanger width.

21. (New) A heat exchanger comprising:

a thermally conductive base;

a thermally conductive cover spaced from said base;

a plurality of thermally conductive walls of thickness T extending between said base and said cover;

a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;

wherein each narrow channel has a width W(mm),

wherein a height of each narrow channel is less than about 3.15mm,

an inlet end, and an outlet end; and

wherein the minimum number of channels/meter N is defined by the approximation:

$$N = 195 * W + 5.$$

22. (New) A heat exchanger comprising:
a thermally conductive base;
a thermally conductive cover spaced from said base;
a plurality of thermally conductive walls of thickness T extending between said base and said cover;
a plurality of narrow channels defined between adjacent walls, said base and said cover through which a heat transfer liquid flows when said heat exchanger is in use;
wherein each narrow channel has a width W(mm),
an inlet end, and an outlet end;
wherein the minimum number of channels/meter N is defined by the approximation:
$$N = 195 * W + 5; \text{ and}$$

wherein liquid flow through said heat exchanger is in the laminar region.